

HYPEROSMOLAR RINSING AS FIRST AID IN EYE BURNS?

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Introduction

Rinsing in eye burns is an evident emergency aid. Removal of the residual corrosive and chemical neutralization of the chemical active substance are intended.

Hyperosmolarity may provoke a water and consecutive ion flow outwards the cornea removing the contaminating substance out of the corneal and conjunctival stroma. Unless, hyperosmolar fluids over a limit of 600 mOsm are reported to cause pain and harmful effects like epitheliopathy on the eye (2).

To integrate this therapeutical principle, a hyperosmolar solution, Previn® with 820 mOsm/l, was tested in human subjects in order to see whether this high osmolality might be harmful to healthy eyes.

Methods

• Previn®

Previn® introduces a new chemical substance called Diphoterine® (1) in a hyperosmolar fluid of 820 mOsm/l. This rinsing solution mobilizes soluble contaminants out of the anterior eye by hyperosmolar induced (4) water shifts outwards. It also binds all types of soluble corrosives by unspecific reaction.

• Subjects

Ten healthy human subjects (age 31 (+/- 4.5 years)) underwent an eye examination including visual acuity, slit lamp examination, confocal microscopy of the cornea (Wild-Leitz flying-slit) and tonometry (Goldmann). Afterwards the eyes were rinsed with 500 ml of 20°C Previn solution over five minutes. Immediately after rinsing confocal microscopy and slit lamp examination were performed. Three days later another follow up was performed to identify prolonged or late effects.

Results

No.	visual acuity			slit lamp examination			confocal microscopy after rinsing		
	before rinsing	immediately after rinsing	3 days after rinsing	before rinsing	immediately after rinsing	3 days after rinsing	tear film	superficial cells	wing cells
1	1.6	1.2	1.6	-	-	-	+	+	+
2	1.6	1.6	1.6	-	-	-	+	+	+
3	1.2	1.2	1.2	-	-	-	+	+	+
4	1.6	1.6	1.4	-	-	-	+	+	+
5	1.2	1.2	1.2	-	-	-	+	+	+
6	1.6	1.6	1.6	-	mildly red	-	+	+	+
7	2.0	1.6	1.6	pigment on endothelium	mildly red	pigment on endothelium	+	+	+
8	1.6	1.0	0.8	irregularity of dots, endothelium	some white stippling (-)	irregularity of endothelium	+	+	+
9	1.25	1.0	1	-	endothelium distorted	-	+	+	+
10	1.6	1.6	1.4	pigment on lens surface	endothelium contacted	pigment on lens surface	-	+	+
mean	1.33	1.17	1.15						
std	0.24	0.26	0.28						



Fig 1 Occurrence of corneal epithelial superficial cells after rinsing (confocal image)



Fig 2 Occurrence of corneal epithelial superficial and wing cells after rinsing (confocal image)



Fig 3 Increased tear film after rinsing (confocal image)

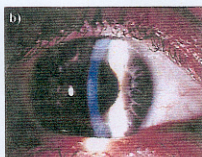


Fig 4 slit lamp examination of proband 8 before (a) and immediately after rinsing (b)



Fig 5 photograph of proband 7 before (a) and immediately after rinsing (b)

Discussion

These results confirm, that PREVIN® as a hyperosmolar substance may be applied to healthy eyes for minutes without causing severe damage.

The observed effects on the corneal surface are part of the mechanical effect of eye rinsing. The pronounced basal epithelial layer as well as the increase of wing cells refer to the mechanical and osmotic stress of the hyperosmolar rinsing.

The assumed additional effect on mobilization of ions from the contaminated eye should be introduced in first aid as an additional principle.

References

- Burgher F, Blomet J, Mathieu L (1996): Le risque chimique et la santé au travail. Editions Prevor, Valmondois France ISBN 2-9510211-0-0
- Dolder Skinner (1983): Ophthalmika. 2. Ed., Schattauer Verlag
- Schrage NF, Reim M (1990): Particulate matter contaminations in the corneal stroma of severe eye burns in humans. Lens and Eye Toxicity Research. 7 (3-4): 427-44
- Schrage NF, Flick S, Redbrake C, Reim M (1996): Electrolytes in the cornea: a therapeutic challenge. Graefes Arch Clin Exp Ophthalmol. 234:761-764
- Schrage NF, Flick S, v. Fischern T, Wenzel M (1997): Temperatur-veränderungen der Hornhaut unter verschiedenen Verbänden. Der Ophthalmologe. 7-8; 94:492-95